

## ROLE OF PETROLEUM PRODUCTS TO MEET CANADA'S FUTURE TRANSPORTATION NEEDS

Arun K. Palit  
Sunoco Inc., Suncor Energy  
Canadian Petroleum Products Institute  
1000 - 275 Slater Street  
Ottawa, Canada K1P 5H9

### ABSTRACT

Petroleum products will continue to play an important role in Canada's transportation industry and in other sectors of the economy today and for the foreseeable future. In recent years, environmental, health and security of supply concerns have been raised about the role of petroleum products in the Canadian economy. These public concerns and actions taken by the petroleum industry are reviewed. This paper discusses the currently announced major capital spending plans underway by the Canadian oil sands crude producers that will significantly increase the flow of Canadian "synthetic" crude to the USA. Properties of oil products produced from these synthetic crudes are examined. In the future, market forces and quality requirements will determine how these synthetic crudes will be upgraded for their environmentally acceptable use as transportation fuels.

### INTRODUCTION:

In recent years, concerns have been raised about the role of petroleum products in the Canadian economy. Environmental, health and security of supply concerns have led to suggestions that Canada should reduce its dependency on oil products. The purpose of this presentation is to demonstrate that, while some of the concerns are legitimate, petroleum products will continue to play an important role in Canada's transportation industry and other sectors of economy to-day and for the foreseeable future.

The paper begins by acknowledging Canadian Petroleum Products Institute's (CPPI) recognition of the environmental and social concerns that the Canadian public has about oil products. The first part of this paper labeled "Main Public Concerns and Beliefs" is our understanding of what the public is concerned about and what it believes. We then seek to put these concerns in perspective by quantifying the magnitude of the issues and referencing benchmarks. The paper demonstrates that the petroleum industry continues to take action on many of the public's concerns. It informs the reader as to the very strong economic and social benefits and the secure nature of the Canadian oil products business. The paper then discusses the major capital spending plan underway by the Canadian oil-sands crude producers which will significantly increase the flow of Canadian "synthetic" crude to the USA. We compare the favourable properties of oil products produced from synthetic crudes to the less favourable properties and conclude by noting that market forces and future quality requirements will determine how these synthetic crudes will be upgraded for their environmentally acceptable use.

### MAIN PUBLIC CONCERNS AND BELIEFS

A survey of recent public opinion polls and Canadian media identify several main concerns the public has with respect to petroleum usage.

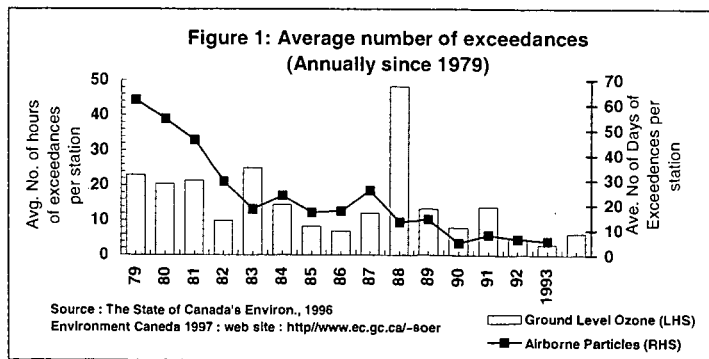
1. Pollution of air in our cities
2. Impact on personal health
3. High prices of oil products and consumer belief that prices are unfair
4. Oil spills and environmental damage
5. Global warming
6. Energy Security:
  - Do we have enough petroleum resources
  - What are the impacts from increasing demands
  - Are we using petroleum efficiently

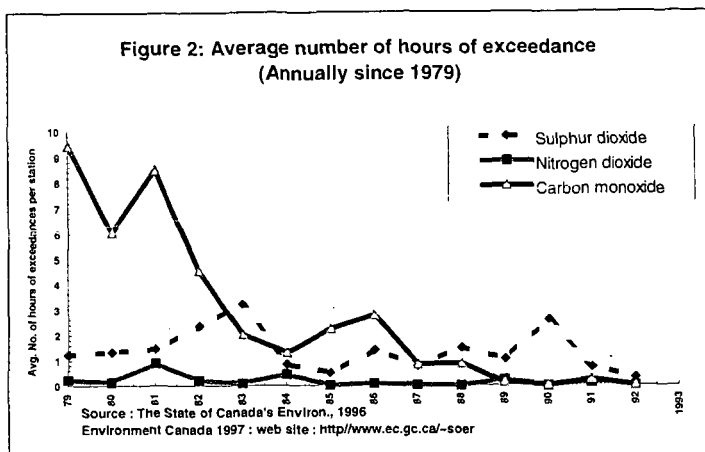
The public wants some actions now to address these concerns.

Clearly, oil products usage has an impact on urban air quality, and on air issues in general. Smog, a brown summer haze that intermittently forms over some of our cities, is comprised of ground level ozone (a combination of volatile organic compounds (VOC) and oxides of nitrogen (NOx) in the presence of sun light) and fine particulates. VOCs are emissions of light volatile hydrocarbons. The transportation sector (that is the industry plus the end users) is responsible for the majority of the VOCs and part of the NOx. The government has declared that over half of the Canadian population is periodically subjected to unacceptable ozone levels. Smog causes respiratory impact on humans, particularly the young and elderly as well as damaging forests and crops. Transportation sector also contributes to sulphur oxides (SOx) emission which in combination with NOx forms acid rain, that is associated with injury to marine life and vegetation. Heavy fuel oil burned in refineries and commercial heaters and boilers also adds to SOx emission. People are concerned that the air quality is bad and is getting worse due to urban growth. Similarly, oil products use can be linked to other human health issues. Carbon Monoxide (CO), a product of incomplete combustion of carbon based fuels, is a hazardous pollutant and causes oxygen deficiency in human lungs. Major portion of CO emissions are related to the transportation sector. Gasoline contributes to most of man-made benzene emissions through evaporative and exhaust emissions from engines. Benzene is a cancer causing substance. Fine air borne particulates of microscopic size (less than 2.5 microns) from the transportation sector is a complex mixture of soot, ash, metals, salts and acid. It has recently been associated with respiratory illness and premature deaths. People believe that oil products and their use are harmful to human health. Transportation cost, including petroleum products, is a major element of consumer spending, equaling food and greater than clothing. Gasoline price is an item of major debate. Most consumers do not understand why prices seem high, vary throughout Canada, are uniform all over a given market. People are concerned that there have been large international petroleum spills. Volume of transported oil is large, there have been some major international marine incidents and local spills continue to occur. People wonder whether the standards are too lax and will the industry ever improve its track record. Global warming is blamed for increased frequency of hurricanes, floods, fire, drought, loss of shoreline and such diseases as malaria. People believe that increasing emissions of greenhouse gases (GHG) are leading to global warming. In their mind they question the sustainability of fossil fuel burning, as over 75% of carbon dioxide, a leading greenhouse gas, comes from fossil fuel use. Finally, the public believes that we may be selfishly wasting petroleum, a precious non-renewable resource, thus depriving the future generations of its effective use. Overall, while oil products are central to modern life, public concerns about their use and effects are understandable and need to be addressed.

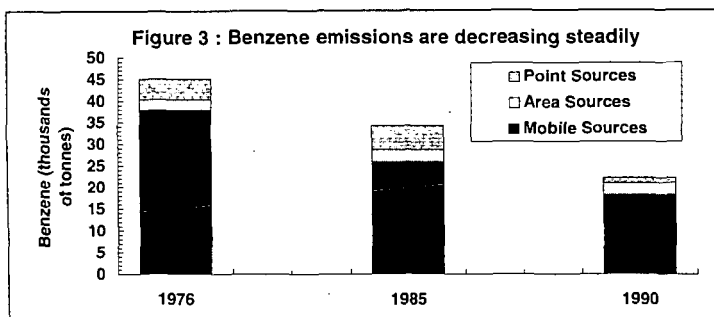
#### THE DIMENSIONS AND SCIENTIFIC ASPECTS OF THE PUBLIC CONCERNS

In fact, the Canadian air quality is very good and is getting better, but progress needs to continue. The figures below demonstrate that the average levels of pollutants measured in major cities throughout Canada are generally coming down (Figures 1, 2). Similarly, health issues related to oil product use will continue to diminish by sustained industry efforts to reduce toxic releases and reformulated oil products..

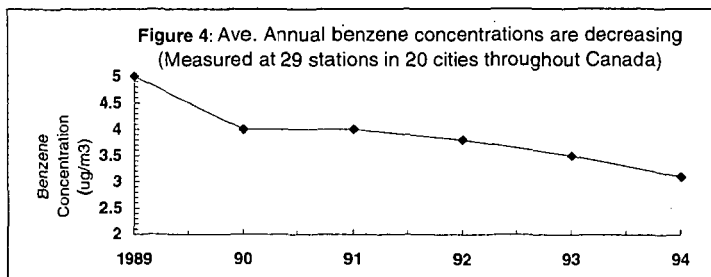




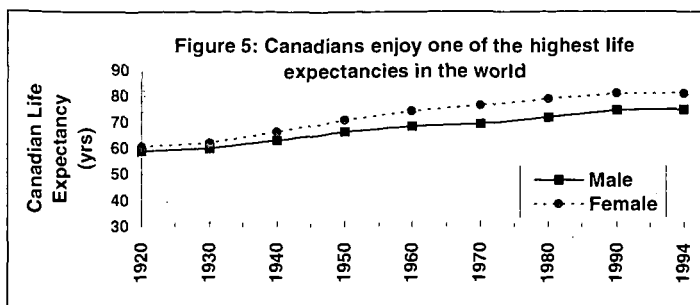
Canadians are fortunate to live in a beautiful land of great natural resources and to be among the healthiest people on earth (Figures 3,4,5). Gasoline is reasonably priced in Canada.



Source : BC DM Task Force on Cleaner Fuels, May 11, 1995

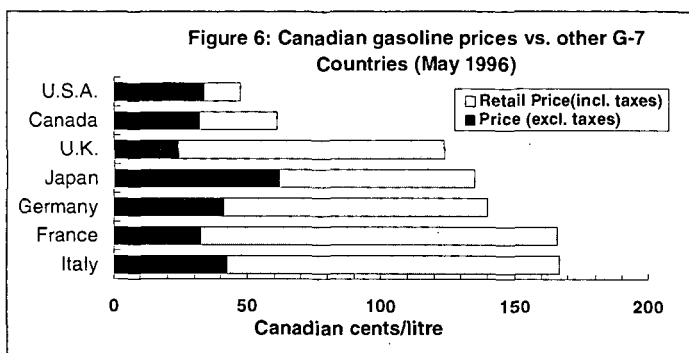


Source : Levels of Air Toxics in Canadian Cities : Benzene; Canada's National Environmental Indicator Series, 1996; URL : <http://www.ec.gc.ca/~soer>

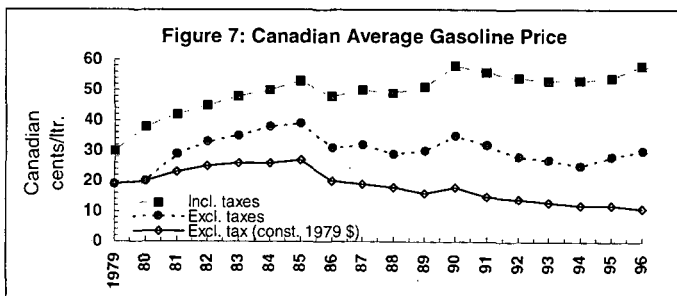


Source : Statistics Canada. Cat. 82-221-XDE

The Federal Competition Bureau has found through many investigations that our products are competitively priced. Canadian gasoline prices are lower than most G-7 countries. In fact, in real terms, gasoline prices have gone down (Figure 6, 7).



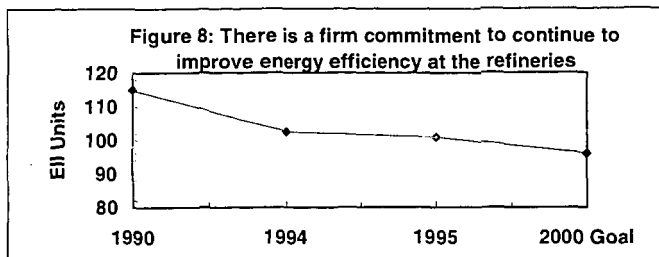
Source : Petroleum Communications Foundation, Gasoline Price Report, 05/28/96



Source : Sector Competitiveness Framework Study, 1994, Petroleum Communication Foundation, 05/28/96

To date, the size and the extent of Canadian spills cannot be compared with major ocean tanker disasters. The Canadian industry's goal is to achieve zero spills. Marine response continues to be a high priority for the industry. Three new response organizations became fully operational in 1995. Global climate change is an environmental issue with economic, social and trade dimensions. For sustainable development, these multi-dimensions need addressing in an integrated way considering Canada's unique national circumstances. Large, short term GHG reduction targets through limits on petroleum fuel use would significantly impair the Canadian economy. Climate change is a complex long term issue and the supporting science is still emerging. However, CPPI believes that reasonable steps can be taken meanwhile. Considering the impact that climate change actions would have on jobs, economic growth and deficit reduction, this long term issue needs flexible

long term goals as well as realistic short term targets. CPPI supports and is active on voluntary measures, improved energy efficiency (Figure 8) both in our operations and nationally through customer education.

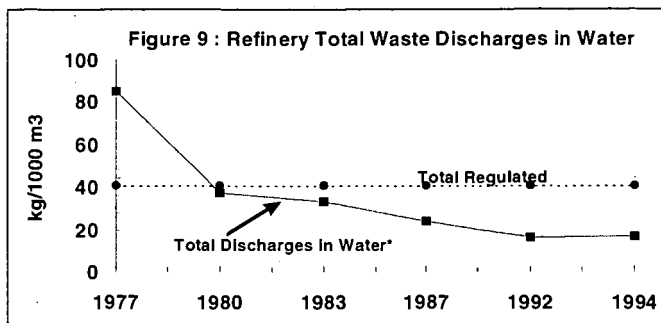


Source : CPPI 1995 Environmental and Safety Performance

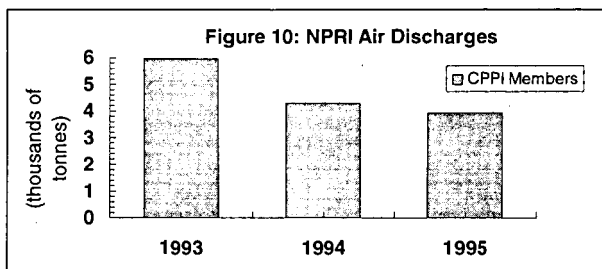
To achieve long term goals, CPPI supports R&D that allows emergence of new economically viable technology and reduces scientific and economic uncertainty as well as flexible policies which allow economic turnover of capital stocks towards least cost solution. Canada has abundant petroleum resources, proven hydrocarbon reserves which can be economically produced and the country is a net oil exporter. Canada has more oil in our oil sands than all the Mid-East combined. The industry is progressive, is a world leader in technological innovation and has increased investments and exploration activities which will extend the useful life of Canadian petroleum resources. In summary, the environmental issues and other public concerns surrounding oil products may not be as significant as one would initially suspect, but the industry need to continually improve its performance.

#### THE RECORD OF OIL PRODUCTS INDUSTRY IN RECOGNIZING AND RESPONDING TO ENVIRONMENTAL AND SOCIAL CONCERNS

Canadian oil products companies have continued to improve the environmental quality of products and operations to meet and better cleaner air goals. Some examples of the improvements are : gasoline reformulation to meet tough national standards to combat air pollution (1995), reduced gasoline volatility during the summer nationwide (1990), introduction of cleaner burning gasolines with deposit control additives (1985), gasoline vapour recovery implementation at terminals and other storage facilities (1991), national program for low sulphur diesel introduction (1994), fuel efficient lubricating oil introduction (1987) etc. Many changes are progressing in our manufacturing, oil product movement and retail operations. In refining facilities, fugitive emission control, enhanced sulphur recovery and flare minimization, toughest water effluent quality standards in the world and reduction of toxics are being achieved. In the area of oil and products movements we are trending towards double hull vessels to minimize spill impacts, pipeline leak detection systems, gasoline tank truck driver certification, and marine oil emergency plans are some areas to note. In retail operations we should list areas such as vapour recovery during gasoline delivery, replacement of underground tanks with new double walled fibreglass tanks, improved leak detection, ground water monitoring and contaminated soil remediation. We have significantly improved the environmental performance in areas such as refinery discharges to air and water. The bottom line is that the oil industry has recognized the importance of environmental issues and has taken real actions to improve performance of its products and operations (Figures 9,10).



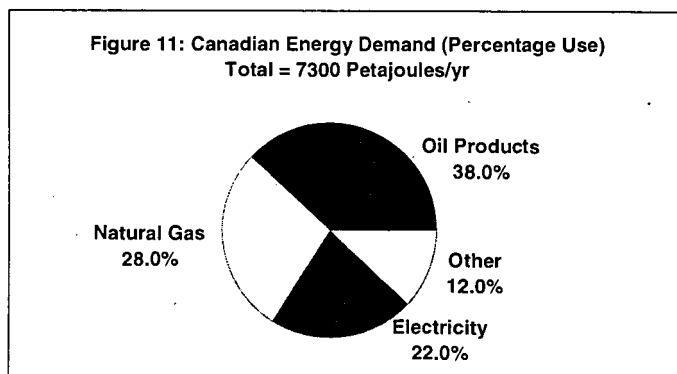
Source : CPPI, First Annual Performance Measures Report, April 24, 1996, P13



Source : CPPI Environmental and Safety Performance

#### THE IMPORTANCE OF THE PETROLEUM PRODUCTS INDUSTRY TO THE CANADIAN ECONOMY

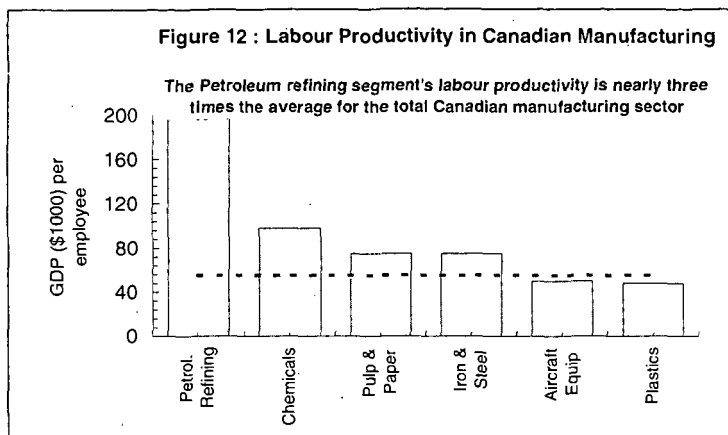
Oil products represent more than a third of Canada's current energy usage (Figure 11) and meet 98% of our transportation fuel needs. In fact, petroleum products are the competitive market place energy choices in most sectors of the Canadian economy. Given our vast size, climate and resource based economy, Canada is a high energy intense country.



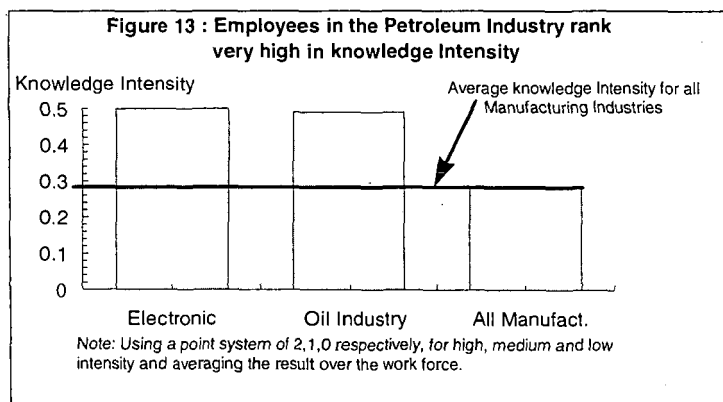
Source : Energy Efficiency trends in Canada : NRCan, April 1996, pp.85

However, Canada has the most diverse energy mix of the G7. The petroleum refining segment's labour productivity is nearly three times the average for the total Canadian manufacturing sector. In today's market, compared to other alternative fuels, oil products are the lowest priced transportation fuel on a pre tax basis. Taxes on the activities and products of the Canadian downstream industry are a major source of revenue to the

Canadian governments. Based on performance, reliability, safety and performance, Canadian consumers have made a substantial investment in vehicles and facilities designed to use oil products. The oil products industry is also a significant source of employment and highly skilled value adding jobs. Overall, the oil products industry is an important element of the Canadian economy, and is well positioned to meet Canada's energy needs (Figures 12, 13).



Source : Infometrics Limited, SCF Petroleum Products Part 1, 1996



Source : Sector Competitiveness Framework, Part I, 1996;  
Statistics Canada Census Data 1986-91

#### CANADIAN OIL SANDS SYNTHETIC CRUDE INDUSTRY

In 1996, Canada produced over 150 million barrels of oil from Alberta's oil sands which is equivalent to about 20% of Canada's crude oil production. Alberta has over 300 billion barrels of recoverable reserves in the oil sands deposits, greater than all the Mid East combined estimated reserves. Several companies have announced mega-plans for increased production of crude and bitumen blends from Canadian oil sands (Table 1). Projected investments of CS 25 billion by 2020 is expected to triple Canadian oil sands crude and bitumen production. A significant portion of the existing oil sands production and the expanded production will be supplied to the USA. Synthetic crude end products qualities are different from conventional crudes. The favourable properties of oil products produced from synthetic crudes are compared to the less desirable properties (Table 2). Market forces and future quality requirements will determine how these synthetic crudes will be refined to supply the fuels for the year 2000 and beyond.

**TABLE 1 : MAJOR EXPANSION PLANS FOR OIL SANDS & HEAVY OIL**

Company	Announced Capital (Billion \$C)	Comments
Suncor	2.2	Expands Capacity from 105,000 bbl/d to 210,000 bbl/d
Shell	1.0	Bitumen Production capability : \$375 MM for a Heavy Oil pipeline to its refinery in Edmonton & additional capital for Upgrader
Mobil	1.0	Bitumen production within next five years
Syncrude	3.0	Expands capacity from 208,000 bbl/d to 312,000 bbl/d
Koch	1.0	90,000 bbl/d of new bitumen facility by 2004
Amoco, Pan Canadian, CS Resources, Gulf, Imperial Oil, Elan etc.	2.5	Various announced projects in Alberta
IPL Energy	0.3	Pipeline to carry Suncor's products

**TABLE 2 : SYNTHETIC CRUDE & PRODUCT QUALITIES DIFFER FROM CONVENTIONAL CRUDES**

Desirable Features	Less Desirable Features
<b><u>Whole Crude</u></b>	
<ul style="list-style-type: none"> <li>■ Low Sulphur 0.1 - 0.3 %</li> <li>■ Low Bottoms</li> <li>■ Very Low Corrosive Contaminants</li> <li>■ High Gas Oils</li> </ul>	<ul style="list-style-type: none"> <li>■ Diesel Cetane ~ 33 - 38</li> <li>■ Low Jet Smoke Point</li> <li>■ High Diesel Aromatics ~ 45 %</li> <li>■ High VGO Aromatics ~ 60 %</li> </ul>
<b><u>Distillate Cut</u></b>	
<ul style="list-style-type: none"> <li>■ Low Sulphur</li> <li>■ Low Pour Point &lt; - 65 °F</li> <li>■ Excellent Freeze Point &amp; Cloud Point</li> </ul>	

#### ACKNOWLEDGEMENTS

The author wishes to acknowledge Ray Burton (Imperial Oil Ltd.), Gene Carignan (Petro-Canada), Gerry Ertel (Shell Canada Products Ltd.), Bruce Orr (Imperial Oil Ltd.) and the Canadian Petroleum Products Institute for their work on the original internal CPPI position paper which formed the basis of this article.